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Author

Fielding, Gordon J.

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Gordon J. Fielding

School of Social Sciences and
Institute of Transportation Studies
University of California, Irvine

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Institute of Transportation Studies
University of California, Irvine
Irvine, CA 92697-3600, U.S.A.
<http://www.its.uci.edu>

ABSTRACT

Changing economic conditions facing American transit since World War II are reviewed and strategies for coping with current problems are analyzed. The most critical issues are financial. The cost of producing transit has been rising at about twice the rate of inflation, while local, state and federal assistance has begun to taper off after a dramatic increase in the early 1970s. Management's response to hard times is analyzed: transit performance is being monitored more critically; peak-period alternatives to regular transit are being implemented and new fare structures which are more effective and equitable are being introduced. Strategies are integrated into a budget-based, financial planning cycle in which capital acquisitions and service deployment are related to anticipated revenues. Part I reviews the changing objectives between 1950 and 1980. Part II, which will appear in the next issue, outlines management's response to the need for improved efficiency.

CHANGING OBJECTIVES FOR AMERICAN TRANSIT

PART I 1950-1980

Gordon J. Fielding
University of California
Irvine, California 92717

1. INTRODUCTION

Transit accelerated back into the mainstream of American urban policy in the 1970s. The downward trend of ridership was reversed, antiquated equipment was replaced, new rapid transit systems were built for San Francisco, Washington, D.C., and Atlanta, and modern buses were provided to expand transit service in virtually every city and many rural areas. But America's transit renaissance has been achieved at high cost. Over the past decade, the cost of operating transit service has risen 51% when adjusted for inflation while state, local, and federal assistance to transit has begun to taper off after a dramatic increase in the early 1970's. Largely due to the desire to maintain low fares while simultaneously expanding service, the growth trend in operating revenues has lagged far behind the increase in operating costs (Fig. 1).

This widening gap between revenues and expenses has placed many American transit systems at the brink of fiscal collapse. In 1981, the U.S. General Accounting Office reviewed the state of the industry reporting that, unquestionably, "transit is in a serious financial situation" (Bonnell 1981). It has been variously estimated that between

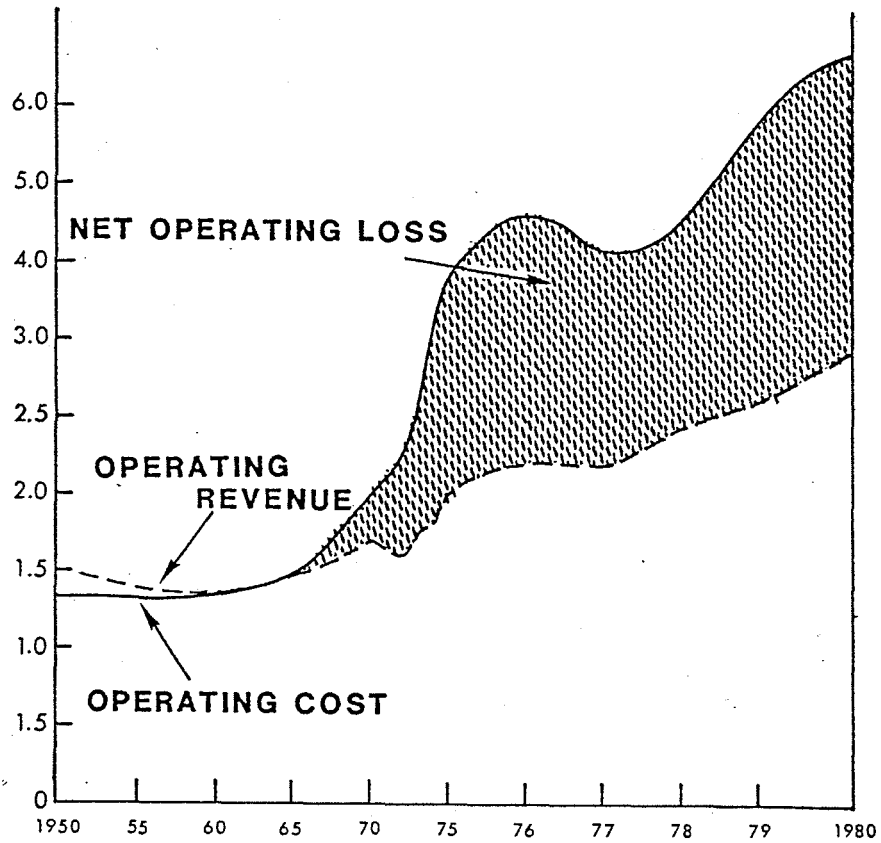


Fig. 1 US operating cost and operating revenue trends 1950-80. Values have not been adjusted for inflation as in Tables 1 and 2.

Source: 1981 Transit Fact Book, Tables 6 and 7.

40 and 150 systems may be in jeopardy, including many systems in small to medium-sized cities where ridership growth has been the most dramatic. One by one, systems have begun to shut down for lack of operating funds or as in Boston and Chicago have required emergency bailout funds to continue operation.

The intent of the Reagan Administration to phase out all federal operating assistance for transit by 1985 has added to the crisis, leading some analysts to believe that American transit may be as endangered today as it was in the 1950's and early 1960's when federal intervention was required to save the industry from near certain demise (Altshuler 1979).

American transit has reached a crossroads. More than a decade of public investment in transit has not changed the propensity of Americans to commute by automobile. Although transit ridership has increased, the U.S. Bureau of the Census preliminary reports for 1980 indicate a 10.6 percent decline in the use of public transit for metropolitan work trips since 1970. Spectacular increases in transit's share of trips has been achieved in southern and western states. However, this has been more than offset by declines in Chicago, Boston, New York and Philadelphia--four metropolitan areas which account for 46% of total peak hour ridership (Markowitz 1983). Also, transit's ability to solve energy, environmental and social ills has come under serious question. And there is growing recognition that the fiscal appetite of transit is both voracious and out of control.

Opposition to transit spending is growing at all levels of government, placing increased pressure on transit managers to

demonstrate, on the one hand, that they are providing an essential public service, and on the other hand, that they are doing so in an efficient and effective manner. Objectives for American transit are changing, yet still unclear, and the challenge for management is formidable.

Fortunately, there are signs that the industry is beginning to respond to increased demands for fiscal accountability. Transit performance is being analyzed more critically, peak-period alternatives to conventional transit are being implemented, and new, more equitable, fare structures are being introduced. Rational financial planning techniques, which relate capital acquisitions and service deployment to anticipated revenues, are being developed and implemented. Management is beginning to respond to hard times.

Part I traces three decades of change in American transit policy and explores the causes of transit's current fiscal distress. Part II, which will appear in the next issue, outlines management's response to the need for improved efficiency and includes examples of how sound management techniques can be used to improve transit's economic stance.

2. CHANGING OBJECTIVES

Unlike transit in Europe, which has been integrally linked with urban growth and development, American public transit is fundamentally a creature of politics. A study of the history of American transit policy is at the same time a study of changes in broader federal policy.

In the period since the end of World War II, the American transit industry has experienced three distinct eras, each with different goals and objectives and each requiring different managerial strategies (Cherwony and Ferreri 1981). Changing objectives for American transit have substantially influenced industry decisions regarding fares, marketing, and service provision, and in a sense are at the root of transit's current managerial dilemma. This section reviews these changes and illustrates how they have affected transit's fiscal and operational policies.

2.1 Decline under private ownership

Until 1965, transit in America was essentially self-supporting (Tables 1 and 2). Private operators provided the majority of service and they relied on farebox revenues to support operations and capital investment. Routing and service decisions were made largely on the basis of profitability. Even in those cities where public agencies had assumed control over operations, the farebox was the primary source of revenue. The role of the federal government was one of deliberate neglect. Transit was perceived as a local responsibility whose costs were to be financed by its users. At the federal level, the doctrine of the farebox clearly held sway, and the mandate for transit was clear: profit or perish.

But transit had fallen on hard times. Post-WW II America was preoccupied with highway expansion, and transit was viewed as a dying

Table 1. Service Produced 1950-80

	1950	1955	1960	1965	1970	1975	1980
Passenger Vehicles (1)							
Rail (2)	22,986	14,532	11,866	10,664	10,600	10,712	10,749
Bus (3)	63,334	58,557	53,426	51,053	50,750	51,514	60,234
Total	86,320	73,089	65,292	61,717	61,350	62,226	70,983
% Change		-15.3%	-10.7%	-5.5%	-0.6%	+1.4%	+14.1%
Total Vehicle Miles (4)							
Rail (mills)	906.5	561.1	465.7	436.9	440.8	448.4	404.8
Bus (mills)	2,101.1	1,886.4	1,677.1	1,571.3	1,442.3	1,541.3	1,690.2
Total (mills)	3,007.6	2,447.5	2,142.8	2,008.2	1,883.1	1,989.7	2,095.0
% Change		-18.6%	-12.4%	-6.3%	-6.2%	+5.7%	+5.3%
Miles of Route (5)							
Rail	10,813	6,197	3,935	2,173	2,081	---	1,617 ⁽⁶⁾
Bus	52,482	53,428	56,696	61,266	57,063	---	122,169
Total	63,295	59,625	60,631	63,439	59,144	---	123,786
% Change		-5.8%	+1.7%	+4.6%	-6.8%	---	+109.3%
Employees							
Average No.	240,000	198,000	156,400	145,000	138,040	159,800	189,300
% Change		-17.5%	-21.0%	-7.3%	-4.8%	+15.8%	+18.5%
Operating Cost per Vehicle Mile							
All Modes (\$)	0.46	0.56	0.64	0.72	1.06	1.89	3.11
1980 (\$)(7)	1.52	1.64	1.65	1.72	2.06	2.67	3.11
% Change		+7.9%	+0.6%	+4.24	+19.8%	+29.6%	+16.5%

Table 2. Service Consumed 1950-80

	1950	1955	1960	1965	1970	1975	1980
Originating Passengers (8)							
Rail (mills) (2)	4,903	2,586	2,005	1,882	1,746	1,492	1,513
Bus (mills) (3)	8,942	6,603	5,516	4,916	4,186	4,151	4,845
Total (mills)	13,845	9,189	7,521	6,798	5,932	5,643	6,358
% Change		-33.6%	-18.2%	-9.6%	-12.7%	-4.9%	+12.7%
Passenger Revenue (9)							
Rail (\$ mills) (2)	532.0	404.1	343.6	327.6	415.1	535.0	751.1
Bus (\$ mills) (3)	854.8	954.8	991.3	1,011.7	1,224.0	1,325.5	1,817.1
Total (\$ mills)	1,386.8	1,358.9	1,334.9	1,340.1	1,639.1	1,860.5	2,568.2
% Change		-2.0%	-1.8%	+0.4%	+22.3%	+13.5%	+38.0%
Total (1980 \$)(7)	4,592.1	3,967.6	3,449.4	3,196.8	3,183.3	2,629.3	2,568.2
% Change		-13.4%	-13.1%	-7.3%	-0.4%	-17.4%	-2.3%
Average Fare per Passenger							
All Modes (\$)	10.0	14.8	17.8	19.7	27.6	33.0	40.4
1980 (\$)(7)	33.1	43.2	46.0	47.0	53.6	46.6	40.4
% Change		+30.5%	+6.5%	+2.2%	+14.0%	-13.1%	-13.3%
Originating Passenger per Vehicle Mile							
All Modes	4.6	3.8	3.5	3.4	3.2	2.8	3.0
% Change		-17.4%	-7.9%	-2.9%	-5.9%	-12.5%	+7.1%
Passenger Rev. per Vehicle Mile							
All Modes (\$)	.46	.56	.62	.67	.87	.94	1.23
1980 (\$)(7)	1.52	1.64	1.60	1.60	1.69	1.33	1.23
% Change		+7.9%	-2.4%	---	+5.6%	-21.3%	-5.3%
Operating Rev. per Vehicle Mile							
All Modes (\$)	.48	.58	.66	.72	.91	1.01	1.29
1980 (\$)(7)	1.59	1.69	1.71	1.72	1.77	1.43	1.29
% Change		+6.3%	+1.2%	+0.6%	+2.9%	-19.2%	-9.8%
Ratio Oper. Rev. to Oper. Cost per Mile							
All Modes	1.04	1.04	1.03	1.00	0.86	0.53	0.41

NOTES FOR TABLE 1 AND 2:

1. Source: 1981 Transit Fact Book, Table 5.
2. Includes subway, surface (light) rail and cable (after 1975) in all rows. Automatic guideway and commuter rail excluded all rows.
3. Includes trolley buses in all rows.
4. Source: 1981 Transit Fact Book, Table 13.
5. Adapted from Statistical Abstract of the U.S., 1974, p. 566. 1978 Data from National Urban Mass Transportation Statistics 1981, p. 1-51 and APTA.
6. Statistics for 1978: 1980 not available.
7. Gross Domestic Product "Implicit Price Deflator" base year 1980 = 100. Derived from Gross Domestic Product "Implicit Price Deflator" base year 1972 = 100. 1981 Economic Report of the President to the Congress, p. 239.
8. Source: 1981 Transit Fact Book, Table 11. Transfers excluded. Revenue passengers from 1940-76. Linked passenger trips after 1977 including no fare and all charter rides.
9. Source: 1981 Transit Fact Book, Table 8. Auxiliary operating revenue excluded.

industry, rooted in obsolescent technologies and land use patterns (Altshuler 1979). Increasing affluence, urban sprawl and the dominance of the automobile had eroded transit's natural market--autoless individuals making short trips in high density areas. Between 1950 and 1960, population in the suburban areas ringing the nation's cities grew by 43.6 percent, while equivalent growth in the central cities was a mere 11.4 percent (Smerk 1974). Transit proved inherently unsuited to the travel patterns of the new suburban families and, in turn, the new low density areas proved inherently unsuited to economical service provision.

From 1950 to 1960, transit ridership plummeted from 13.8 billion to 7.5 billion (Table 2). In response to this decline, operators decreased service and increased fares--which further served to decrease ridership. Attempts of many private operators to strike a balance between ridership, fares and service were unsuccessful; the decline in passenger revenue was accompanied by deterioration of equipment, route abandonments, and eventual bankruptcies. Between 1954 and 1963, 194 transit companies went out of business, leaving many small and medium-sized cities without service (Kirby and Green 1979). And by the end of the decade, it was clear to many other operators that it would be virtually impossible to continue to exist as a private enterprise. Total vehicle miles had declined by 31%. Table 2 presents the fiscal consequences in actual and adjusted prices. Fare increases, as represented by average fare data, helped offset declining ridership. But passenger revenue continued to decline although not as precipitously as passengers.

2.2 Transit's renaissance

Federal policy toward transit was modified by social conflicts in the mid-1960's, which directed attention to the problems of the nation's cities and the frustrations of its minorities. Big city mayors and labour leaders capitalized on changing public opinion to gain support for transit legislation. Transit was presented as an integral part of the new federal commitment to urban renewal, and a more "balanced" transportation system.

Prior to 1961 there was no direct federal funding for urban transit. The first breakthrough was in the Housing Act of 1961 authorizing \$42.5 million in loans for transit operators and commuter railroads and grants to demonstrate new methods of transportation. However, these programmes provided no financial relief for transit because, even with federally insured loans, private investments could not be attracted to revitalize urban transit. An attempt was made to pass more comprehensive legislation in 1962, but it failed because organized labour would not support it unless their collective bargaining rights, achieved under private ownership, were guaranteed.

Pressure continued for direct capital grants to transit agencies. These were approved by the Urban Mass Transportation Act of 1964 on the basis of two-thirds federal one-third local matching for areas with acceptable comprehensive metropolitan plans and 50-50 matching for areas which did not present acceptable plans within three years. Although initial funding was only \$50.7 million, the Act established the principle

of federal capital assistance for transit and incentives for comprehensive metropolitan development. The need "for economical and desirable urban development" was emphasized because the liberal Democratic administration saw transit assistance as an element in their design for urban revitalization. Transit officials and labour leaders saw it as a precedent.

In its earliest versions, the UMT Act provided only for capital assistance. The question of operating assistance--or the possibility that operating costs would escalate to any significant degree--was deemphasized in an effort to gain broad congressional support. Limited funds were made available for capital renovation, vehicle replacement and for the purchase of surviving private systems by public agencies.

Organized labour supported federal assistance only after it was guaranteed by Section 13(c) of the Act that employees of private transit systems would suffer no "worsening of their positions with respect to their employment" when transferred to public ownership. And Section 13(c) has been used by labour unions to obstruct changes in work rules and capital investments which would have increased labour efficiency.

The concern of labour was genuine. Support for capitalization of public transit had been promoted in cities like San Francisco and Miami by claiming that new capital investments would reduce the dependency upon labour. Automated transit systems would only require capital funding and once operating would be self-supporting out of the fare box because of their low operating costs. Not only were funds to be made available for new construction of rapid transit facilities, but they were also to be

available to help communities purchase failing private transit companies. Labor's concern over the continuation of collective bargaining rights and to the maintenance of the level of transit employment was warranted, given the plans that were being promulgated for American transportation. The political muscle of organized labour was apparent in the early attempts to obtain federal assistance. They had refused to support the 1962 legislation and it had failed. Only after labour had endorsed the legislation in 1964 did President Johnson place the Urban Mass Transportation Act on his "must pass" agenda (Smerk 1974). Without labour's endorsement, transit assistance would not have passed. And labour has played a similar role in subsequent amendments to the 1964 Act. Seldom is the pivotal role of labour recognized by transit officials when they criticize organized labour for declining productivity in the industry. Without labour's support, the industry would not have survived outside the major metropolitan areas.

One by one, privately owned firms were transferred to public ownership in an effort to salvage the failing industry and meet the new federal mandate for improved transit service. By 1967, over 50 percent of all transit riders were carried by publicly owned transit systems (APTA 1981).

Womack and Altshuler (1979) studied the decision to shift from private to public ownership of transit in eight case study American cities. They describe how, initially, "there was little discussion of the possible consequences for labour costs, or operating costs generally"

and how it was believed that federal intervention would actually have beneficial cost impacts.

In the early years of federal intervention, farebox recovery was still a key objective and operating policies still patterned after the behavior of a private firm. As late as 1970, 86 percent of the operating cost per mile was still being covered by operating revenues. Womack and Altshuler (1979) describe how operators were able to use the doctrine of farebox recovery to their advantage:

In each case, as long as the public owners made it clear that the systems would be fare-box financed, operating costs and wage demands rose very modestly. New service demands were also modest, in part due to the insulation of the public authority from day to day politics and in part because the farebox finance test was a very effective argument against initiating lightly patronized service.

Between 1965 and 1969 \$548 million was provided in transit capital assistance. After 1966 funding was also provided for comprehensive planning and transit programmes were transferred to the new Department of Transportation; all of which enhanced transit's role in federal policy. However, capital and planning grants alone could not sustain service. Vehicle miles operated were reduced and fares increased between 1965 and 1970 (Table 1 and 2).

Public transit, even if possessing certain advantages such as tax free status and federal assistance for equipment purchases, could not stabilize transit on a farebox-financed basis. Only after 1970 did it become apparent that increased federal assistance would be needed.

By the early 1970's, America's attention had shifted to new problems--dwindling energy supplies, air pollution, traffic congestion, urban sprawl, and the needs of the increasingly vocal elderly and handicapped sectors of the population. Transit had new goals. It would reduce pollution and congestion, save energy, curb urban sprawl, and provide essential mobility to the elderly and handicapped.

While transit's direct constituency was relatively small, federal support for increased transit assistance had broad political appeal. The explanation, says Altshuler (1979), lies in the fact that transit proved to be "a policy for all perspectives" on the urban problem.

Whether one's concern was the economic vitality of cities, protecting the environment, stopping highways, energy conservation, assisting the elderly and handicapped and poor, or simply getting other people off the road so as to be able to drive faster, transit was a policy that could be embraced. This is not to say that transit was an effective way of serving all these objectives, but simply that it was widely believed to be so. Additionally, because the absolute magnitude of transit spending was so meager at the beginning of this period, it was possible to obtain credit for rapid program growth with quite modest increases in the absolute magnitude of expenditures.

Broad political support for transit expansion, coupled with the growing recognition that this could not be accomplished without significant federal assistance, contributed to the authorization in 1974 of Section 5 of the UMT Act, which provided for direct payments to offset transit operating expenses.

From 1974 to 1978, the growth of the federal transit assistance programme was staggering, making it one of the most rapidly growing

public programmes of the decade. Pucher (1980) studied the growth of transit assistance in large U.S. metropolitan areas from 1973 to 1978 and documented the extent of this increase. Between 1970 and 1978, total government subsidization of transit in the United States (including federal, state, regional and local sources) increased almost tenfold, from only \$540 million to \$5.2 billion. The most significant finding of Pucher's study was the extent to which the federal role had increased. Prior to 1961, there had been no federal role in transit assistance, and even as late as 1970, the federal contribution was overwhelmed by state, regional and local contributions. By 1978, however, the federal government actually funded a greater percentage of the total operating and capital subsidy in the United States than all other government levels combined. It is somewhat ironic, noted Pucher,

. . . that in the United States, with its long tradition of decentralized government, the federal role in transit financing is significantly greater than the corresponding role of national governments in most Western European countries, even with their long traditions of very centralized government structures.

Jones (1982) has criticized this federal largesse, observing that Congress backed into a deeper and deeper commitment to mass transit without reaching agreement on the objectives to be achieved and without anticipating the eventual cost of federal involvement. Federal subsidies were approved without systematic inquiry into the ability of local governments to shoulder the cost of subsidy without federal assistance. And federal aid was made universally available without any standard of

need or measure of merit. The consequences are apparent on Table 1: employees and operating cost per vehicle mile increased disproportionately to any increase in service.

By 1978, government subsidies had replaced passenger fares as transit's major source of operating revenue (APTA 1981). The doctrine of farebox recovery had been supplanted by more pressing political considerations.

The American transit assistance programme is essentially redistributive in nature, with funds flowing from, and back to, local areas on the basis of politically determined criteria. Jones (1979), Meyer and Gomez-Ibanez (1981), Ortner and Wachs (1979) and others have shown how the need to gain a broad base of political support for the transit assistance programme--especially among suburban congressmen and legislators--encouraged transit managers to expand service into suburban areas, beyond the densely populated urban areas and congested radial corridors, where transit could compete with auto travel. Farebox recovery and service utilization had become secondary indicators of transit effectiveness as managers sought to deploy service on the basis of political "fairsharesmanship" and other socially oriented considerations.

Capturing a larger service area also became an objective for transit managers. As federal operating assistance was distributed on the basis of demographic criteria rather than transit service supplied or consumed, larger service area populations increased the proportionate share which a transit agency could claim. Between 1970 and 1980 miles of route more

than doubled nationally, yet the vehicle miles operated increased by only 11% (Table 1). Miles of route were expanded, but frequency of service, even on crowded inner city routes, was reduced so as to permit service area expansion. Jones (1979) illustrates these changing objectives with an excerpt from a staff report written for the Santa Clara County (California) Transportation District. "The resources that are available for operating cost payment are collected from the entire county" says the report. "The deployment of buses should reflect the source of these funds."

A strict cost-per-rider measure of transit effectiveness is a narrow efficiency approach with an inherent assumption that the objective is to deploy vehicles so as to secure the most riders per hour. That objective is not now part of the General Transit Plan Social concerns clearly govern, rather than costs.

As the result of the subsidies that they accepted, transit managers lost the incentive to operate their systems efficiently. Transit's success was now being measured in terms of fare stabilization, ridership gains, service expansion, and compliance with a host of federal requirements governing labour practices, vehicle procurement, and service to the elderly and handicapped. This combination proved financially devastating. Fares were kept low in order to maximize passengers regardless of their marginal cost. Instead of trimming back and improving service to existing riders, transit managers pushed service out into areas of low-density where revenues could not cover marginal costs

and thereby contributed to low productivity and the financial tailspin that the transit industry is now encountering.

Portland, Oregon, cited in 1976 by the U.S. Department of Transportation's Urban Mass Transportation Administration as one of transit's 'success stories', registered a 178% gain in vehicle miles of service and a doubling of ridership between 1969 and 1976. But during this same period, revenues fell below 40% of operating costs and operating expenses increased more than fivefold (Altshuler 1979). By 1980, the ratio of operating revenues to total operating expenses had dropped to 31% (APTA 1981a) and the agency had placed a moratorium on further service expansion.

In short, operating assistance to American transit had proved a mixed blessing. If one chooses to measure the success of the operating assistance programme in terms of stabilization of fares, ridership increases, service expansion, and improved service for the transportation disadvantaged, the programme had achieved moderate to considerable gains. But if reasonable control of operating expenses and cost-effective service deployment are one's measures, the programme was a failure. American transit had been given unrealistic social and political objectives, incompatible with operating and financial efficiency. In an effort to gain a broad political base and meet federal mandates, transit had simply spread itself too thin.

And now the American political system entered a new era. By the end of the 1970's, the public was becoming disillusioned with the worsening state of the economy, taxation which seemed to grow out of proportion to

gains in personal income, and the relative failure of expansionist social programmes to make any real changes in the status of the nation's urban poor.

Transit had not been a panacea for urban problems. The taxpayers' frustration was not only that transit had cost so much but that in terms of its ability to reduce pollution and congestion, conserve energy, and effect a major shift in travel behavior, it had achieved, proportionately, so little. While originating riders had increased 7% during the decade, transit's share of metropolitan work trips continued to decline.

Work stoppages, equipment failures, fare increases and service curtailment had begun to reveal the extent of transit's fiscal crisis. Attention was beginning to shift from transit's social objectives to the more pressing issue of its burgeoning costs. It was becoming evident to many observers of the transit programme that additional assistance was merely being used to pay for escalating operating costs rather than service enhancement and that this trend was likely to continue unless significant changes were made in the operating assistance programme.

Wildavsky (1974) has observed that in times of reassessment of national priorities, public programmes may be placed in jeopardy if their fiscal appetite appears to grow too fast in relation to other programmes. This is precisely what happened to American transit in the 1980's.

2.3 "New Federalism"

The inauguration of Ronald Reagan in 1981 signaled another shift in federal policy toward transit. Responding to public concern over the rising cost of federal programmes, the new administration unveiled its policy of "New Federalism," emphasizing local control of public programmes and expenditures, fiscal prudence and accountability, elimination of costly federal regulations, and the increased involvement of the private sector in public service provision. Like many other social programmes, transit became a vulnerable target for administration cost-cutting.

Declaring that the "intention of the Reagan Administration is not to take a walk away from mass transit," Secretary of Transportation designate Drew Lewis told a Senate confirmation panel in January 1981 that although he recognized the importance of mass transit, the administration's primary goal would be to encourage the reduction of operating costs. "I am a supporter of mass transit," Lewis said, "but I am also concerned about inefficiencies and labour problems. I want the federal government involved more in the capital side of the operation and the states providing the operating subsidies".

Transit's new dilemma was epitomized by the front page of the February 20, 1981, issue of Passenger Transport, the industry's weekly newspaper. In ironic contrast, the two lead articles were titled "Transit Riding Sets Twelve Year Mark" and "Reagan Proposals Would End Operating Assistant by 1985." Transit's renaissance had drawn to a close

as the Reagan Administration announced its intention to withdraw all federal operating subsidies for transit by 1985 and place primary funding emphasis on capital assistance to existing bus and rail systems in large urban areas.

The official federal policy towards transit, as announced in May 1981, would be guided by the following principles:

- return of local service and operational decisions to state and local levels
- delegation of greater financial responsibility to users, local communities, and businesses that benefit from transit service
- reduction of federal rules on acquisition and use of capital equipment and facilities; and
- encouragement of more private enterprise participation through car pooling, van pooling and incentives for transit use.

As of December 1982, the Reagan Administration had not been successful in implementing these policies. Only where regulatory reform could be implemented through administrative orders, have they been successful. Other policies are stalemated. Federal assistance is continuing, but the increases sought by transit agencies and the phase-out of operating assistance sought by the administration are stalled by Congressional opposition.

The American Public Transit Association in opposing change has predicted dire consequences as a result of the proposed elimination of federal operating support. A March 1982 survey of 122 transit systems revealed that:

- 47% of the systems claimed that they would have to consider terminating all service (37% were definite about shutting down)
- most respondents said that major fare increases, some up to 150%, would be necessary
- many indicated that service reductions of 30%-60% would be necessary
- most respondents said that because of service cuts and fare increases that have already been required, they have lost public support and have little chance for local funding.

Concern over lack of adequate local support has been particularly intense in the nation's older urban areas where unemployment and outmigration have already eroded the tax base and strained local budgets.

Several industry analysts have predicted that the withdrawal of federal operating subsidies for transit will trigger another 'downward spiral' of service curtailment, fare increases, loss of ridership, and fiscal collapse. There is some indication that this prediction may be valid. In January 1982, the American Public Transit Association reported that over 32% of U.S. transit systems had raised their fares between June and October of 1981 and that, for the first time in eight years, the industry was registering a decline in ridership. While the federal government has expressed sympathy for the plight of the industry, policy continues to be governed by the recurring theme of "fiscal responsibility and good business sense."

Transit managers are in a quandry. It is still not clear whether transit should be evaluated as an essential, public service; with due consideration of the inherent costs of government intervention, or as a

business; with cost-effectiveness and self-sufficiency the prime objectives. And there is growing concern, given the unique character of the industry, that the latter objective may not be economically feasible.

Little guidance has come from federal officials. Jones (1982) provides a critique of current federal policy. "In the process of dismantling federal involvement in public transportation," he observes, "the Reagan Administration is simply retracing the path of expansion-shedding programmes without serious appraisal of their merit or effectiveness. The Reagan Administration's transit policy represents a return to 'non intervention' Republicanism rather than a constructive effort to fashion a programme that would be more effective and efficient."

Womack and Altshuler (1979) continue the argument. At the moment, they note

. . . fiscal restraint is clearly a more important value than at any previous point during the life of the federal transit program, but it is by no means clear yet how important this value is or how long and how completely it will take precedence over other values served by the transit program.

American transit is still at the mercy of the capriciousness of American politics and the interest groups who shape policy. Testifying before the Investigation and Oversight Committee of the U.S. House of Representatives' Public Works and Transportation Committee, Altshuler criticized the federal government for its lack of consistent goals and objectives for transit. "For transit to succeed," he asserted, "transit managers cannot be political footballs, spinning their wheels with

zig-zag policies because of the complete political turnover every four years".

Similar concern was voiced by the U.S. General Accounting Office (Bonnel 1981). "It became clear during (our) review," noted the agency

. . . that mass transit has been assigned an array of goals to accomplish by federal, state and local governments and that these goals were poorly defined, not prioritized, and in some cases, conflicting. The end result has been confusion as to what mass transit is supposed to do and an inability to determine what mass transit is accomplishing.

What is clear, however, is that funding--from all levels of government--is declining and that transit managers will be called upon to provide a reasonable level of service within this new framework. Their primary objective will be preserve the gains made possible by the fiscal largesse of the 1970's within the fiscally austere environment of the 1980's. Once again, they will have to strike a new equilibrium between revenues, service and ridership.

This will require managerial skills of a high order and the application of demonstrated techniques of performance measurement, cost analysis, market segmentation, service diversification and resource allocation. Whether the industry can shift its operational strategies in time to avert another downward spiral of ridership is still unclear. But there is growing evidence that, among the more innovative and sophisticated properties, beneficial changes are already being made. The viability of American transit may hinge, simply, on the ability of its current generation of managers to manage.

Since World War II, the American transit industry has passed through three distinct phases of development: the first, characterized by cost cutting and service reduction; the second, by rejuvenation and expansion of service and facilities; and the third, characterized by the need for more efficient allocation of resources.

Part II of this essay will be concerned with the latter concept: application of sound managerial techniques to rational resource allocation. It will contain a brief review of the factors underlying the escalation of transit operating costs and then discuss: performance assessment, cost-allocation models, peak-hour service alternatives and pricing strategies. These techniques will be integrated into a management strategy for transit planning and development.

CHANGING OBJECTIVES FOR AMERICAN TRANSIT:
PART II MANAGEMENT'S RESPONSE TO HARD TIMES

Gordon J. Fielding
University of California
Irvine, California 92717

Changes in American transit since 1950 were described in the previous issue of this journal. Three phases of development were identified: the first, characterized by cost cutting and service reduction; the second, by rejuvenation and expansion of service; and the third, and current phase, characterized by "hard times" and the desire to use resources more efficiently. Using labour, capital and energy resources to produce transit service more efficiently requires new skills in performance analysis and the ability to analyze the cost of producing transit for different markets. Pricing strategies need to be evaluated and alternative modes of para and private transit must be considered if transit is to sustain the expansion achieved under the liberal assistance policies of the 1970's.

Expansion of service into areas where marginal costs greatly exceed marginal revenues has been the primary reason for the cost escalation of American transit. Costs per vehicle mile, even when adjusted for inflation, increased 80% between 1965 and 1980 while both originating passengers and revenue per mile declined (Part I, Table 2). Expansion into suburban areas has been costly. Labour productivity falls because more unproductive out-of service miles must be travelled between garages

and endpoints for suburban routes. Also, as suburban demand is primarily for peak-hour, one-way service, it is difficult to utilize labour efficiently.

A number of recent studies based upon British cost modelling procedures have revealed this extra cost of peak hour travel. In three California case studies for example, peak costs averaged 136% of mid-day costs (Cervero et al. 1980). Costs for peak-hour, freeway-express service in Los Angeles were more than 300% of mid-day costs for regular service. Introduction of part-time labour to cover additional peak hour service helps labour productivity. However, as Chomitz and Lave (1981) have shown, savings from part-time labour are often lost through work-rule concessions granted in order to obtain union acceptance. Only in communities like Seattle where more than three times the number of vehicles operate in the peak than the base, and where management has successfully created pieces of work for part-time employees, is there substantial savings.

Fares have neither increased commensurate with costs, nor have they been reflective of operating costs which vary by area and time of day. Rush-hour trips and longer journeys from the suburbs to the central city impose higher costs on transit than non-rush hour and shorter trips, but fares seldom reflect such variations. During the 1970s, American operators abandoned fares which differ by time of day and with trip length (Wachs 1981). This preference for low, uniform fares with free transfers is not new. Wohl has shown that similar pricing--the nickel fare and free transfers--coupled with steadily rising inflation from 1900

to 1920 caused the demise of many private street railway companies (Wohl 1982). The combination of cost escalation, low fares and the encouragement this provided for long distance, peak-hour trips aggravated the financial plight of transit operators in the 1920's. These errors were repeated during the 1970s. The routes and the romance of the cars were remembered as cities attempted to restore their street railway systems, but the policies which caused their demise were forgotten.

Realization that errors were being repeated and that transit service was neither expanding nor achieving societal benefits commensurate to its escalating cost has generated criticism (Altshuler 1979 and Bonnell 1981). Unfortunately, the cacophony of criticism contains few suggestions that transit managers will accept. Proposals which suggest user-side subsidies, shedding of services, or a return to private operation are too radical. They cannot be adapted easily into existing organizational or institutional arrangements. Therefore, they are neglected. Transit managers would rather reduce service and increase fares than surrender control over governmental funding and service territory.

Institutional arrangements also limit the acceptable options. As the largest transit agencies are quasi-independent, local governments who derive authority from state governments rather than cities or counties, they are more severely constrained than European agencies from influencing land use or restricting auto use which might increase the demand for transit. Managerial emphasis must be placed on those elements of performance over which management has more control; performance

assessment, peak-period service alternatives and new fare policies, are being tried in an attempt to mitigate the current financial crisis facing American transit.

4. PERFORMANCE EVALUATION

Techniques to assess transit performance have been useful to transit managers because they have shown them how to measure the costs of producing service and to analyze its use by route, division and even in comparison with peer systems. Preference for measuring performance in terms of ridership rather than net cost persists, but this is gradually diminishing as managers are compelled to reallocate or reduce service.

Initial performance studies were state or regionally based. These were useful for defining terminology and suggesting uniform data collection strategies. Recent studies have been more analytical and have sought to explain variations in performance in terms of size and character of the service area, management structure and labour contracts (Long, forthcoming). Publication of national transit performance data in 1981 has permitted more reliable comparison between properties; analytical studies are now being conducted by transit agencies examining current against previous performance in comparison with peer group systems. Management research sponsored by UMTA in the late 1970's has proved helpful to transit now that more analytical approaches are being sought.

4.1 Background work on performance indicators

Although the concept of transit performance evaluation and the development of performance indicators is not new, it was not until theoretical concepts were related to empirical data in the late 1970s that their utility was recognized. In 1958, the National Committee on Urban Transportation specified transit service standards, objectives, and measurement techniques (Public Administration Service 1958). This study originated many of the measures and standards used by transit today.

Performance evaluation is an attempt to balance quantitative systems approaches to management with the reality of public programmes where goals are ill defined and measurement always controversial. Although it involves monitoring of current activities, it is primarily forward looking to help management decide what to do next in terms of service changes and fare policy. It differs from performance audits which primarily look backwards at financial compliance and the economy and efficiency of implementation. Development of performance evaluation in transportation agencies has been dependent upon identification of objectives, development of appropriate measurement indicators and availability of reliable data.

The problems of performance evaluation were the subject of a major study published by Tomazinis (1976). Tomazinis defined conceptual and methodological aspects of evaluating productivity, efficiency, and the quality of urban transportation systems and insisted that measures of efficiency and the use of resources be separated from measures of

effectiveness in achieving ridership. Fielding, Glauthier, and Lave (1977) successfully integrated the theoretical concepts with data available from transit agencies in their analysis of transit performance in California and the State of Washington. Transit performance was divided into efficiency, effectiveness and overall elements. Nine indicators of performance were defined in terms of data that were readily available from transit agencies. Sinha and Jukins (1978) adopted the same conceptual format but used data from the American Public Transit Association (APTA) to establish sixteen indicators for the comparative analysis of twenty-nine Midwestern transit systems. Systems were clustered in terms of operating speed, coach operator wage rates and population of the urban area to facilitate comparative analysis.

Improvements in performance evaluation were achieved between 1975 and 1980 because elements of transit production were identified which were capable of being represented by statistics readily available from transit agencies. Federal, state and local governmental regulations now require the reporting of transit statistics. The concepts defined and used by Fielding et al. (1977) have been used in California, Florida, Iowa, New York, Minnesota, and Pennsylvania to define state performance monitoring programmes (Miller 1979).

Transit is a social service system comprising the elements of service inputs, outputs and consumption. Efficiency relates to the way in which factors such as labour, equipment and facilities and fuel are used to produce output represented by vehicle miles or hours of service. Effectiveness measures the consumption of transit output as well as

transit's impact on such societal goals as reducing traffic congestion. Overall indicators integrate efficiency and effectiveness measures as when costs of service input are related to consumption, e.g. cost per passenger (Fig. 2). Cost-efficiency, service-effectiveness and cost-effectiveness are also used to describe these same three elements of transit production.

Failure to distinguish efficiency from effectiveness measures creates confusion. Efficiency can be described as "doing things right" whereas effectiveness is "doing the right things." Efficiency is clearly under the control of transit management, and it can be held accountable for achievements. Effectiveness is more difficult to evaluate, because management can "do the right things" and not succeed. For example, it can produce reliable service and deploy it in the right area at the right time, but consumers may choose alternative travel modes based on cost, convenience or comfort advantages: factors over which transit management has little control. Overall measures which combine the cost of producing transit with indicators of consumption like cost per passenger or cost/revenue ratio are more difficult to assess because variation can occur in either component.

Numerous transit performance studies have been completed using these performance concepts. There has been considerable debate over the relative emphasis that should be given to efficiency as opposed to effectiveness elements. Transit operators emphasize effectiveness measures expressed in terms of passenger statistics. This is illustrated by the case studies of Seattle and Los Angeles included in the

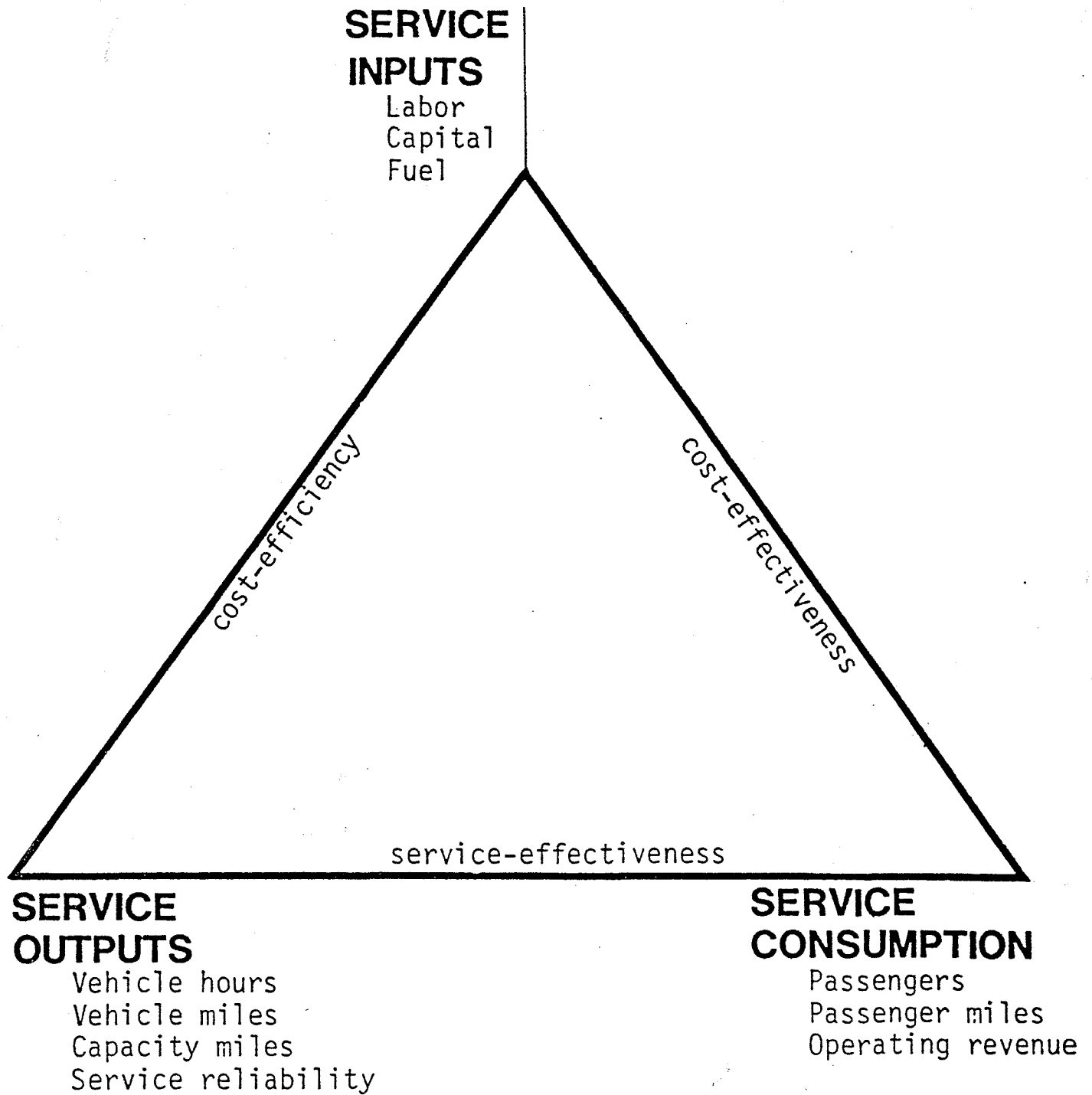


Fig. 2 Transit performance concepts. These established the dimension used to identify sets of performance concepts (Table 3).

Proceedings of the First National Conference on Transit Performance (Public Technology Inc. 1978). The APTA policy statement in this same document defines both efficiency and effectiveness but gives priority to ridership as the key indicator of transit system effectiveness.

4.2 International programmes

National performance evaluation programmes tend to reflect national concerns. Whereas American programmes previously emphasized ridership and now are more concerned with costs of producing service, European programmes emphasize the quality of service provided. Quality of service indicators such as missed trips per route kilometer, deviation from schedule, passenger waiting time and overloading are emphasized (OECD 1980). Service effectiveness measures receive more attention in mature systems where transit as a social service is accepted and the focus is upon improving quality. For example, the programme recommended for use in the Netherlands provides helpful categories for assessing levels of service from the user's viewpoint (Fitch 1981).

The qualities which make transit attractive to users are listed in the Netherlands' study under two headings: accessibility and comfort and safety. The former includes measures of frequency, reliability, speed and transfer requirements. The latter includes probability of getting a seat, cleanliness, ease of boarding, availability of shelters, smoothness of ride and passenger safety.

The cost of producing service is not neglected, but its assessment occurs in relation to planning of service changes and capital investments. London Transport epitomized this approach when it recommended assessing capital, service and crew changes in terms of maximizing passenger miles for a given budget (Kirby and Green 1979). Cost per seat mile and passenger mile are calculated and matched against revenue per passenger mile to be gained or lost. These are ideal measures of efficiency and effectiveness which few American operators can utilize because they do not have reliable data on passenger miles.

Canadian systems appear more concerned with overall performance than either efficiency and effectiveness, although a survey conducted in 1976 indicates that the conceptual distinction is understood (Presage 1978). Canadian operators are more dependent on farebox revenue than American operators. Performance measures relate the cost of labour and capital inputs to the revenues derived (Sage 1978). Such overall measures are useful when monitoring performance for one system over time, but difficult to interpret when making comparisons between systems because variations occurring in both the numerator and denominator are difficult to identify.

Confusion over appropriate objectives for performance assessment is still evident in American transit. Generous governmental support during the 1970's encouraged agencies to express performance in terms of passengers and miles of service. Emphasis on service expansion was abruptly halted with the change in federal policy in 1981. However, a new set of objectives for transit has not been established at the local level

because the desire for low fares and service expansion persists. Transit agencies are opposing attempts to reduce federal funding, and at the same time, are petitioning state legislatures and local governments to provide new revenues to offset any loss of federal funds. The need for performance assessment and economy is recognized although objectives appropriate for the task are not apparent.

4.3 Measuring transit performance

Availability of a national report which accumulates transit industry financial results by uniform categories has assisted performance analysis. The Urban Mass Transportation Act was amended in 1973 to include Section 15 which required a uniform system of accounts and records as well as a uniform system for reporting. UMTA used the results of a previous industry study (Project FARE) to issue regulations in 1977 requiring annual submission of reports by all agencies who desired federal operating assistance. Initial results were released in 1981 based upon the 1978-79 financial year (UMTA 1981).

Using the Section 15 Report and demographic data from Census Reports, cost efficiency, service effectiveness and cost-effectiveness performance measures can be calculated. Comparability between transit properties is possible, as well as comparison within a property over time. Using performance indicators defined in terms of the Section 15 statistics, management can monitor performance periodically and implement corrective

action when necessary. Section 15 data provides the basis for control over operations which a systems approach to management requires.

To help managers utilize the wealth of new information available in the Section 15 reports, Anderson and Fielding (1982) used factor analysis to establish statistical indicators representative of the performance concepts illustrated in Figure 2. A wide range of performance measures was possible. Holec (1980) had used forty-seven measures in his analysis of transit performance in Michigan. The advantage of the two smaller sets of nine recommended by Anderson and Fielding is that they enable management to focus upon performance assessment without being overwhelmed by data (Table 3).

Efficiency as well as effectiveness measures of performance are included. However, emphasis should be placed upon the efficiency measures and, particularly, those concerned with labour utilization. In the analysis of the Section 15 data for 1978-79, labour statistics were not identified by separate measures. Employee wage data were not required for the first year so labour statistics were captured by the output per dollar of cost indicators. Improved labour efficiency is of paramount concern when attempting to curtail operating cost increases because it represents about 80% of the cost of producing transit when fringe benefits and pensions are included. Labor costs for operators account for almost one-half transit operating cost with the remainder for mechanics, professional and administrative labour.

The ratio between vehicle service hours and pay hours is the most useful measure of labour efficiency. It can be calculated systemwide, for

Table 3. Performance measures by concept

<u>COST EFFICIENCY</u>	<u>INITIAL SET</u>	<u>ALTERNATIVE SET</u>
Output per Dollar	Revenue vehicle hour per operating expense	Revenue vehicle hours per total wage and fringe expenses
Vehicle Efficiency	Vehicle miles per peak vehicle requirement	Vehicle hours per peak vehicle requirement
Fuel Efficiency	Vehicle miles per gallon diesel	(Same)
Maintenance Efficiency	Vehicle miles per maintenance employee	Peak vehicles per vehicle maintenance expense
<u>SERVICE EFFECTIVENESS</u>		
Utilization	Passenger trips per revenue vehicle mile	Passenger trips per revenue vehicle hour
Social Effectiveness	Revenue vehicle hours per service area population	(Same)
Public Assistance	Passenger revenue per total capital and operating assistance	Passenger revenue per total operating assistance
Revenue Generation	Ratio of operating revenue to operating expense	(Same)
Safety	Revenue vehicle hours per accident	Million vehicle miles per accident

Statistics defined in the Urban Mass Transportation Industry Uniform System of Accounts and Records and Reporting System, Vol. 2, 1977. After Anderson and Fielding (1982) pp. 36-38.

operating divisions or for different employee groups. It is especially helpful in analyzing whether operating employees are used effectively by minimizing overtime and maximizing the proportion of paid time actually operating vehicles in revenue service. Considerable variation exists between operators. This can be explained by the labour contract provisions, the number of "extra board" employees required to cover for absences and the ratio of peak-to-base service. All are elements under management's control and progress can be monitored and improved over time. Availability of the data on pay hours after each pay period assists the monitoring of this measure. It also serves as a financial review between actual pay hours and budgeted pay hours.

Measures of overall efficiency are provided by linking cost as the denominator with service output (measured in hours or miles) as the numerator. As wages are the principal cost in transit agencies, separate evaluations for operators, vehicle maintenance and administrative personnel are helpful for some performance studies. As wages exclude fringe benefits, such studies significantly underestimate the actual cost of these employment categories.

Cost per unit of output also provides the basis for the development of cost allocation models which allow overall costs to be apportioned to vehicle miles and hours and to vehicles. Cost models are essential when analyzing the costs of operating different types of service (i.e., express versus local) and for making strategic decisions about service expansion or curtailment. Their increasing use is a reflection of the desire to use more analytic approaches to management.

5. COST ALLOCATION MODELS

Three types of cost allocation models are useful for analyzing the efficiency of routes and the cost of proposed changes: fully allocated cost, fixed and variable cost, and temporal variation models (Cherwony et al. 1981). The latter two are variations of the first. All three are calculated by using annual budgeted costs for factor inputs and allocating these to service output measures like vehicle miles, service hours, and number of vehicles required. Each type is an adaptation of research originating in Great Britain to data sources and operating conditions in America (Kemp 1980). Their current popularity has helped transit managers understand how the costs of producing transit vary by route, division and time of day and has encouraged cost reduction strategies.

5.1 Fully allocated cost models

Cost-allocation models are based on the concept that the cost of producing service is a function of a few service output variables such as vehicle miles, hours and peak vehicles. Transit costs are allocated to one or more output variables, summed, and then divided by the quantity of the variable used to arrive at the unit cost for each variable. A common form of a cost allocation model is:

$$UC = U_h(VH) + U_m(VM) + U_v(PV)$$

where:

UC = Unit cost of route, route segment or type of service

Uh = Unit cost associated with hours

VH = Vehicle hours required

Um = Unit cost associated with miles

VM = Vehicle miles required

Uv = Unit cost associated with vehicles

PV = Peak vehicle required

As additions or deletions to service requires changes in hours, miles and peak vehicles, costs can be estimated for planning purposes. Also, as costs can be projected using the disaggregated factor input costs, future costs can also be estimated.

Cost allocation models are now used by many transit properties (Cherwony et al. 1981). Level of specification varies and each is property specific because it is based on costs unique to that system. Some include riders as a variable (Chicago and Cincinnati) while the Southern California Rapid Transit District in Los Angeles has a pull-out factor which captures maintenance and servicing costs. However, the allocation methodology is similar in each case.

Fully allocated cost models received their name because all system operating cost items are assigned to the output variables. Consequently, the sum of costs for all routes will equal total operating costs for that system. Annual costs are normally used to estimate coefficients although it is possible to use monthly or pay-period costs. Costs will change with factor costs so the model needs to be recalibrated annually, or more frequently if there is substantial deviation from budget.

The three variable model provides a technique which is fairly easy to compute using the Section 15 chart of accounts. It is useful when analyzing alternative service changes and in allocating costs to routes. Three variable models are more accurate than single variable models which are based on average costs per service hour or mile. However, the assignment of account items does mask important variations in operating cost. For example, overhead costs are allocated to routes by the peak vehicle requirement. This can be justified in terms of marginal cost theory where the relevant costs are those required to produce an additional increment of service, but is criticized because express routes which only operate in the peak must divide the cost over four or five hours, whereas afternoon school routes avoid peak vehicle charges altogether. Two approaches which treat vehicle cost by time of day are variable cost models and temporal variation models.

5.2 Fixed and variable cost models

Fixed and variable cost allocations differ from fully allocated models in treatment of overhead costs like advertising and vehicle depreciation which vary to some extent with the amount of service produced. This approach is helpful when considering small changes to service which may involve use of another peak vehicle, but will not cause increased administrative cost or additional building maintenance. Assigning a full peak-vehicle share to such small changes unfairly penalizes the proposal. This approach is well established in Great

Britain where capital costs are carefully analyzed when considering changes to established service (Taylor 1975). In the United States fixed costs usually account for less than 10 percent of operating cost. The additional task of classifying expense items by cost type has been neglected in favor of more careful analysis of labour costs.

Appraisals of small changes in service are also assisted by the data on overhead costs. One of the problems when assessing peak-hour express bus service is the heavy burden of overhead costs assigned when the vehicles are in service only a few hours each day. Whether or not to assign fixed overhead to the peak vehicle service units can be decided by the magnitude of the proposed change. When one or two buses are added, it is probably not appropriate because it is labour costs rather than overhead costs which really make the difference between alternative transit proposals.

5.3 Temporal variation models

Peak-hour transit service is more costly to produce than off-peak service because demand for service is concentrated into a few morning and afternoon hours and labour agreements prevent management from adjusting the work day to coincide with peak demand. Even when part-time operators are permitted under the labour contract both the percentage of their work and the type of work assigned is restricted. As a result, average as well as marginal costs of providing additional peak hour services are significantly higher than the cost of providing all day (base) service.

Variation in the unit cost for vehicle hours under the fully allocated cost model obscures these differences, but they can be identified and adjustments made for temporal variations in labour efficiency.

Temporal variation models are cost allocation models which focus on the time period variations in labour cost. Non-driver cost items are assigned to miles and peak vehicles but they are not analyzed in the same detail as labour costs. Labor efficiency is established by developing indicies for the peak and the base period. They are generally derived from an audit of a sample month's data regarding vehicle hours and pay hours during the peak and base period. For the Twin Cities Metropolitan Transit Authority in Minnesota, for example, the labour efficiency for the base was estimated at 1.14 and 1.31 for the peak for a relative labour efficiency of 1.15 (Cherwony and Mundle 1978).

The type of model used, and the data required, must vary with the nature of the decision. The cost of producing transit service did not receive much attention during the 1970s when transit was expanding and there was a surplus of funds. But given the current financial austerity, transit agencies must carefully appraise existing services and seek operating efficiencies. This is especially true when analyzing the financial implications of peak-hour transit and options for sharing the peak load with paratransit providers so as to level out the demand for equipment and labour.

6. PEAK HOUR SERVICE ALTERNATIVES

Accommodating rush hour commuters is the primary cause of transit's escalating costs in major metropolitan areas. More than half of transit passengers crowd onto buses in the morning and afternoon rush hours. Fleet size, maintenance work, road supervision, ticket sales and administration are all sized to accommodate this peak demand. Intensity of peak demand was allowed to increase during the 1970s because managers, pursuing the goal of increased ridership, found it easier to attract new riders with low fares during the peak.

Public transit is much like flood control channels--built to accommodate peak demand. This makes transit very expensive because total capacity is unused most of the time. The same is also true for urban highways but the non-recurring, capital costs are not as apparent as transit labour costs. Bus drivers, whose wages and fringe benefits account for almost half of transit's operating cost, cannot be hired for just those hours in the morning and afternoon when they are most needed. Labor work rules restrict the use of part-time labour and the proportion of split shifts that transit drivers can work. Management's efforts to change these work rules have been severely restricted by federal requirements as well as by pressure from transit labour unions. The result is that peak hour transit has become very costly because labour and equipment cannot be used efficiently.

Costs are determined by the labour contract which varies with the property. Lave (1981) provides an example: Given daily rush hours

between 6-9 A.M. and 4-6 P.M. he assumes that a bus is put into service to cover these peaks and then left idle during the mid-day. A driver for this bus would work a split shift, driving a total of five hours over a "spread-time" of twelve hours. Under typical work rules the driver would receive an eight-hour pay guarantee plus an additional half-time premium pay if the spread time is greater than a specified limit, i.e., ten hours. Thus, the driver receives nine hours pay for five hours of driving. The consequences are even worse when the proportion of split shifts allowed by the contract is already exceeded and the pieces of work cannot be assigned to part-time employees. Then two drivers are required, each of whom would receive an eight hour guaranteed shift--sixteen pay hours--to produce five operating hours.

Management's efforts to change these work rules have been restricted by opposition from transit labour unions and federal labour arrangements. Transit employees are protected against any "worsening of their positions with respect to their employment" as a condition of the receipt of federal transit assistance (Section 13(c) UMT Act of 1964 as amended). The result has been that peak hour transit has become very costly because labour has opposed changes in work rules which would allow the increasing peak loads to be transported more efficiently.

Concentration of riders in the peak is greater in America than in Western Europe. Typical metropolitan bus systems operate with a peak-to-base ratio of over 2.0, whereas in England this figure is about 1.5 (Oram 1980). Affluence, auto availability and urban dispersal all mitigate against off-peak transit in America. And the situation probably

will become worse: the decline of the central city for all but office oriented activities, increased participation by women in the workforce and the unwillingness of off-peak users to pay the higher fares will further reduce off-peak ridership.

6.1 Shedding the peak

Reducing the commitment to peak-hour transit has been advocated by Oram (1979). His concepts derive from knowledge of peak costing models gained while at the London School of Economics and Political Science integrated with his experience in paratransit and pricing options while employed by the U. S. Department of Transportation's Urban Mass Transportation Administration. Oram advocates reducing peak demand by "shedding" patrons to other providers and discouraging discretionary riders from using transit during the peak by increasing peak-period fares.

A variety of paratransit services might accommodate peak-period demand: bus, van, and carpools; shared-ride-taxis (dial-a-ride); or jitneys (Teal 1980). Transit agencies have traditionally opposed these alternatives because they compete for patronage. However, opposition is muted when costs for conventional peak hour service are publicized. The more innovative transit agencies have realized the advantages and used paratransit to both expand their transportation options and reduce costs (Long 1981). The Orange County Transit District in California and Tri-Met in Portland sponsor computerized matching for van and carpool participants. Emphasis is placed on major employers in areas where bus

service is either not competitive with automobile travel or where bus service is already overcrowded.

Imaginative approaches to load-shedding have also been implemented by the Tidewater Transit District Commission (TTDC) in Norfolk, Virginia. TTDC contracts with a private management company to manage a fleet of 141 buses serving urban communities. Because of the military bases in the service area, there is substantial demand for peak-only service to the bases and shipyards. Adding buses to accommodate the demand was considered, but because fixed route service only returns 45% of its cost from the fare box the decision was made to seek other alternatives such as van, car, and buspools, where users not only pay full operating costs, but also the local share of capital costs. The TTDC strategy is not to expand fixed-route bus services but to do everything possible to expand paratransit (Echols 1980). TTDC provides ridesharing services including a fleet of 115 vans for vanpooling and 50 vans for special services for the handicapped under contract with social service organizations. They also acquire buses and lease 30 of them to individuals who commute in bus pools. For community service, where performance analysis has shown fixed-route service to be cost-ineffective, they contract for shared-ride taxi service. This latter strategy has been tested in the City of Chesapeake where two lightly used fixed routes were replaced by "MaxiTaxi" service. Ridership has increased while cost decreased by 43%. Deficit per passenger decreased from \$4.75 in August of 1979 to \$1.85 in April of 1980.

Fare policies also help TTDC manage peak demand. A zone system, together with peak-period surcharges for express service, makes long distance commuting by regular bus increasingly expensive. Bus routes are constantly reviewed for performance (Becker et al. 1981). Each year, resources are shifted from the lowest performing routes and added to those with the highest performance. Paratransit is promoted as a substitute for those areas from which service is removed.

6.2 Other strategies

There are numerous examples of how transit agencies have begun to diversify service provision. Other agencies have attempted to reduce peak-hour costs through negotiating for part-time employees and work-rule changes. These can be helpful in properties where there is a disproportionately high peak hour demand. However, labour concessions are usually hard won and often result in strikes and service disruption. Sharing the market with private paratransit providers is easier to accomplish and offers greater fiscal economies when service is being expanded. Unfortunately, some transit managers still equate success with increasing ridership on their own vehicles rather than with decreasing the cost per rider by utilizing paratransit substitutes. They refuse to admit that the cost of peak hour service is inordinately responsible for bus transit deficits. Hard times will compel them to change. And transit is fortunate that alternative strategies have already been demonstrated by the more innovative operators. Requiring peak users to

pay a fair share of the peak service costs would compel users and elected officials to recognize the need for peak-period alternatives. However, such policies are unusual in America. The low, uniform fare, with free transfers, still prevails.

7. EQUITABLE PRICING

Although it costs at least one-third more to operate regular peak period bus service and from two-and-one-half to three times base costs for peak-only express service, fares do not reflect these additional costs. In Los Angeles, for example, there are no temporal variations in fare, except for a distance surcharge on freeway express buses. The subsidy per peak period passenger is \$1.45 versus \$0.45 during the off-peak. For freeway express trips it is \$3.06 per passenger. Peak-period riders in most American cities are not paying their fair share of the costs. In fact, they are essentially being cross-subsidized by the off-peak riders, many of whom are elderly, unemployed, or totally dependent on public transportation for mobility. Increasing peak-period fares would capture additional revenue and encourage discretionary riders to travel during the off-peak period. By balancing service provided throughout the day, transit agencies could make more efficient use of both labour and capital.

Simply increasing the base fare yields little additional revenue. As off-peak fare elasticities are double the size of peak fare elasticities, fare increases will have a greater impact on the off-peak rider who

travels when there is already excess capacity (Lago et al. 1981). They will also discourage short transit trips which help cross-subsidize longer trips. In a study of three California operators, it was found that riders making short trips--less than two miles--were paying between ten and twelve times as much per mile for their trip as the average user. During the off-peak, these short trips actually generated a positive cash flow for the agency (Cervero 1981).

More equitable fare policies are needed. Distance-based fares with peak-period surcharges produce high positive correlations between trip costs and revenues for a variety of trip lengths and times-of-day. This produces a more equitable fare policy. However, the majority of transit operators adopted low, uniform fares with free transfers during the 1970s and are finding them difficult to alter. Flat fares are simple to administer and easily understood by patrons; drivers like them because they are less troublesome; and local elected officials prefer them because they provide equal opportunity. Fares were reduced in order to provide low income, elderly and handicapped travellers with affordable transportation. Although they provide bigger subsidies to affluent suburban travellers than to poor inner city residents, they are difficult to change (Wachs 1981). Only by using cost models to demonstrate the variations in operating cost can support be developed for changing fare policy.

7.1 Alternative fare plans

The whole issue of peak-period fares in American transit is distorted by the policies affecting auto use. Automobiles and trucks using highways do not pay higher taxes for use during peak periods and when attempts have been made to charge peak hour tolls, these have been rejected as impractical for political reasons. Equitable road user pricing is an anathema. There is an unwritten law in American politics that suggests that if you want to be re-elected don't infringe upon the right of the people to keep and bear arms or to use cars. Parking is also subsidized by employers and shopping centers. Transit would become much more attractive for the journey to work if marginal cost pricing were used to establish parking charges (Shoup and Pickrell 1979). There is little prospect for near term changes in attitudes towards highway user pricing. This makes similar policies in transit unpalatable.

Differential pricing of transit passes offers an alternative approach. Transit operators have previously lost a significant amount of money with "unlimited use" passes priced for marketing rather than revenue generation. Raising prices has meant that low income transit dependent users are most adversely affected. They have difficulty in paying for expensive monthly passes so both income and riders are lost. Imaginative alternatives are beginning to appear. In Duluth, Minnesota the pass is valid all hours except the "peak hour of the peak," when it requires a cash surcharge (Oram 1982). A lower price has been retained, but additional revenue is generated to offset higher, peak only, costs.

It also discourages the discretionary rider from using transit when vehicles are already overcrowded.

Innovative ideas are also coming from Bridgeport, Connecticut, where the Urban Mass Transportation Administration has sponsored fare demonstration projects (UMTA 1981). Rather than offering unlimited monthly rides for a set cost, their "Fare-Cutter Card" permits a reduced fare. In 1982 it sold for \$12.00 and required an additional \$0.25 fare for each ride rather than the \$0.60 regular fare. It is attractive because it does not require a large initial outlay, but still offers a discount for the frequent user. Bridgeport does not have excessive peaking of demand. Where this occurs, the peak-period additional fare could be increased.

Lower initial costs are also attractive to employers who are willing to subsidize bus fares to reduce parking congestion. The \$12.00 per month can be considered equivalent to free or subsidized parking whereas the \$0.25 fare represents the employee cost. Fare revenue is increased with the subsidy being paid by the employer who gains through providing fewer parking spaces and reducing highway congestion for those employees who prefer to drive. Universities and colleges can use this approach effectively. Parking space is at a premium yet never priced at marginal cost. Reduction of peak parking demand is mutually beneficial to the administration, faculty and students. A reasonably priced pass can be subsidized by small increases in parking charges. Additional revenue for the transit agency is generated from the fare box. Prepayment programmes for college students were popular in the early 1970s but most were

abandoned because of the lost revenue or escalating charges. Fraudulent use by other members of the household created much more frequent use than had been estimated by transit agencies who based charges on prevailing use by the general public. By combining a reduced fare permit with a user charge the worst abuses of the previous discount schemes can be avoided.

As fares increase towards \$1.00, pre-paid fare cards have several advantages. For example, transfers are not needed. These are often sold at a "discount" to new patrons at bus stops or even through bus windows. Acceptance of paper money can also be reduced. Older fare boxes were not designed to accept paper money. It jams the fare collecting and counting mechanism and the driver has to stop and call in for mechanical assistance. This creates service delays as well as additional operating costs. Often the paper money is torn in half, folded and deposited without the driver noticing the deceit. The other half is used for the return trip. Banks refuse to accept bills unless unfolded and counted manually. All of which makes paper money more costly to handle than coins. One major transit agency estimates that it costs \$0.03 to process each dollar bill received. The Chicago Transit Authority estimates that it will save \$7 million in 1982 by banning the use of paper money.

7.2 Shopping discounts

As fares rise, transit agencies are reintroducing shopping discounts to encourage transit use during the off-peak. In Los Angeles,

Bridgeport, Connecticut, and Spokane, Washington, transit riders receive discounts at local merchants as a "reward" for riding the bus (Oram 1982). Coupons are either distributed with the purchase of passes or by a special ticket dispenser installed on buses.

Merchant discounts have become an increasingly popular method of advertising in America. Discount coupons are given away in neighborhood newspapers, coupon exchanges are available in supermarkets, and airline travellers receive five or six discount pages with each boarding pass. Discounts are usually worth more than the transit fare so innovative marketing managers not only generate additional off-peak revenue, but also demonstrate the value of transit to local business.

Marketing of public transit has become more targeted to the needs of different segments with less emphasis upon advertising. Newspaper and radio advertising, billboards and low, uniform fares are being replaced with programmes which target different populations and determine the effects of fare and service changes on these groups. The cost of marginal changes in service has become better understood and transit managers are beginning to react assertively towards the anticipated period of fiscal austerity. Projecting costs and probable revenues (subsidies and fares) over the forthcoming five to ten years is imperative. It allows efficient use of modernized equipment and encourages analysis of alternative service and pricing strategies. The objective is to preserve transit in those markets where it remains competitive. Where and when transit is cost-ineffective, paratransit strategies are available to lessen the consequences of service reduction.

8. FINANCIAL APPROACH TO PLANNING

Public transit organizations are budget-based agencies in which service, fares and capital purchases are determined by the funds available rather than return on investment criteria or comparative assessment with other public service requirements. When funds were abundant during the 1970s, service was expanded and new investments undertaken so as to utilize all the available federal, state and local assistance. To do less meant that the funds would go to other urbanized areas. But now that governmental assistance is being reduced, objectives are changing. Transit agencies are adopting more systematic approaches to financial planning which ensure that sufficient funds will be available over the short and long-range planning horizons. And if funds are insufficient, then either economies must be achieved or fares increased to balance projected budgets.

Short-range plans and budgets have been required since 1975. As a condition for receiving federal assistance, transit operators in cooperation with Metropolitan Planning Organizations (MPO), are required to complete and update an annual Short Range Transportation Plan (SRTP). A Transportation Improvement Program (TIP) is required as part of the plan, (U.S. Department of Transportation 1975). The TIP is a staged, multi-year (3-5 year) programme of transportation improvements, proposed costs and anticipated sources of funding: a strategic plan and budget. When capital and operating funds were abundant, the SRTP/TIP was changed frequently to reflect new opportunities. But now operators are using the

SRTP/TIP process to determine priorities, to evaluate alternative methods for achieving goals and to include realistic estimates of total costs and revenue for the programme period. As a result, planning in transit organizations has become budget-based rather than based upon anticipated travel needs and desires.

To comply with administrative directives for regulatory reform, the Department of Transportation has proposed relaxing the SRTP/TIP requirements (Federal Register 1982). Here again is an example of inconsistent federal policy which frustrates transit managers. In their desire to eliminate regulations, politically appointed administrators are prepared to discard a process that has encouraged prudent financial planning. Relaxing the requirements for smaller urban areas deserved consideration, but the major metropolitan areas benefit from the annual cooperative planning process that the SRTP/TIP has required.

Although the SRTP/TIP requirement will probably change, the more progressive agencies have acknowledged the benefits by incorporating the process into their financial planning. Rising costs and declining revenues has created a situation in which there is no choice other than to adopt more analytical and more formal approaches to planning and budgeting. The performance based approach can be subdivided into six steps: (1) Establishment of goals and objectives; (2) Forecasting probable financial resources; (3) Prioritizing service alternatives and determining their fiscal requirements; (4) Translating courses of actions into annual budgets for policy approval; (5) Controlling and monitoring

the implementation of the current budget; and (6) Assessing performance in terms of goals and objectives.

8.1 Assessing performance

Evaluation of service supplied and service consumed in terms of goals and objectives is the weakest link in this approach. Transit is not unique. All government programmes suffer from an unwillingness to evaluate performance in terms of specific objectives (Greiner et al. 1981). This is why governmental agencies are difficult to manage. Effective management requires the ability to direct the efforts of all components towards desired ends and to detect failures at an early stage. It is easier in private business, because objectives are more apparent. It is difficult in governmental agencies, because the objectives are diffuse.

Capability exists within all transit agencies for relating output statistics such as hours or miles of service to the financial cost of producing this service. The Section 15 reports which transit agencies must submit in order to receive federal operating assistance provide all the information necessary to analyze performance and to make comparisons with other transit systems of comparable size and with similar operating environments.

Omission of performance evaluation is not related to volume or accuracy of data, but rather to an unwillingness to establish the relationships between financial investment and operational outcomes. Yet

this information is essential to strategic planning. A continuing cycle of retrospective and prospective evaluations is required. The results are then available as informational support for decisions on service policy, budget appropriations and capital investments.

Federal agencies have been unable to implement regulations requiring performance assessment because of opposition from the transit industry. Even in states like California which have had a longer history of providing operating assistance than the federal government, performance assessments are a weak requirement conducted every third year. However, performance data is collected in compliance with the federal Section 15 reporting requirement and could be used by administrators to evaluate programmes and budgets. Los Angeles County has begun to use this information to provide incentives for superior transit performance (Fielding 1982).

All the elements for the conceptual approach are available to transit agencies, but they have not yet been used as a coordinated strategy. Again, this lapse is a reflection that transit has measured its performance in terms of passengers rather than carefully appraising the cost of producing service. Transit managers are very resistant to attempts to shift emphasis from the goal of increased ridership. More attention is now given to the need for efficient service production, but in any list of agency goals, it will be placed third or fourth behind goals to provide effective transit. If transit is to survive in medium density urban areas, it must, above all else, emphasize the goal of increased efficiency and become more self-supporting.

9. CONCLUSION

The 1980's will be a period of reappraisal and adjustment for American transit. Agencies will have to satisfy the needs of the older inner city areas as well as the suburbs and the congested corridors which connect them. And this must be accomplished amid rising costs and declining governmental assistance. Fortunately some of the strategies for coping with changing economic conditions have been developed as a result of federal research and demonstration programmes. Techniques for performance analysis have been developed, and with the availability of Section 15 data, comparative analysis between and within properties over time is feasible. The same data can be used to calibrate cost-efficiency models which allow routes and services to be analyzed and fares established which bear some relationship to the cost of providing service. Less costly alternatives for peak hour and suburban service have been demonstrated as well as imaginative policies for pricing transit to increase revenues and decrease peak-hour congestion. All of these strategies can be integrated into the financial element of the Short Range Transportation Plan to provide a coordinated programme of transportation improvement.

Development of goals and objectives is essential for service improvement. No assessment of performance is possible without them, yet most transit agencies have been content with weak statements (Hamilton & Hamilton 1981). For example, the Municipality of Metropolitan Seattle amended its Comprehensive Plan for Public Transportation in 1981 and

specified thirty-two goals. Justification for pursuing almost any policy could be identified. A more concise statement of objectives would have assisted the analysis of alternative service strategies. Like many other western and southern cities, Seattle successfully expanded transit during the 1970s by obtaining more than its fair share of governmental assistance. Now its challenge is to control labour costs and increase revenues in order to sustain service. Careful assessment of performance on a route-by-route basis, as well as expansion of paratransit substitutes in suburban areas beyond the city will be important. A more concise statement of objectives will be needed rather than a list of thirty-two goals. Management must orient itself towards producing service efficiently and ensuring that it is used effectively. Such objectives can also be used to develop a systemwide approach to financial planning. For in this manner, short and long-term plans can be integrated into the annual budget cycle and achievements assessed in terms of organizational objectives.

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CAPTIONS FOR FIGURES

- Fig. 1 US operating cost and operating revenue trends 1950-80. Values have not been adjusted for inflation as in Tables 1 and 2. Sources: 1981 Transit Fact Book, Tables 6 and 7.
- Fig. 2 Transit performance concepts. These established the dimension used to identify sets of performance concepts (Table 3).